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More than Just a Simple Twist of Fate: Serendipitous Relations in Developmental Science

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Developmental science · Self-regulation · Serendipitous actions · Serendipitous relations

Abstract

Unexpected, non-normative events are key influences on human development across the life span. Despite this importance, little is known about how an individual may capitalize on unexpected events and transform them into opportunities for sustained positive development. In this article, to address this theoretical lacuna, I introduce the concept of *serendipitous relations* – mutually beneficial, adaptive developmental regulations brought about by the time-extended coaction of intentional self-regulatory actions and unexpected non-normative life events. I enumerate five specific intentional self-regulatory *serendipitous actions* hypothesized to lead to serendipitous relations. Using developmental theory, life examples, and examples from the literature, I hypothesize that serendipitous relations brought about by effective use of serendipitous actions may be important sources of adaptive development. I conclude by offering specific suggestions for future research on serendipitous relations across the life span.

During the Second World War, Percy Spencer and his group of Raytheon engineers spent their days perfecting magnetrons. By 1945, these devices were being installed as the key component in radar defense systems across the United States. That year, on a day that he and his colleagues were working in the lab, Spencer reached into his pocket for the candy bar he had tucked away earlier. It had completely melted. His colleagues jokingly noted that this had happened to them before, but Spencer's interest was piqued. After years of research, this unexpectedly melted chocolate bar provided the inspiration for a ubiquitous kitchen appliance: the microwave oven [Osepchuk, 1984, 2009].

The history of science is punctuated by unexpected discoveries [Roberts, 1989]. The sociologist Robert Merton [1949/1957/1968] termed this phenomenon, where the

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scientist flexibly develops a new theory based on observing an unexpected or anomalous event, "the serendipity pattern." Serendipity is, of course, not the exclusive province of the scientist. Positive, unexpected events often alter the life course of everyday individuals [e.g., Plunkett, 2001; Williams, Soeprapto, Like, Touradji, Hess, & Hill, 1998]. However, while coincidental life events captured the attention of some scholars [e.g., Jung, 1973], much of the extant literature on the developmental influence of unexpected life events focuses on the potentially calamitous results of unanticipated cohort effects like the Great Depression [e.g., Elder, 1974, 1980] or "unhappy accidents," like mistakenly knocking on the door of a murderous gang [Bandura, 1982]. Fortuitous, unexpected life events have been given short shrift, stipulated but not necessarily studied as potential sources for developmental variation [e.g., Baltes, 1983; Brim & Ryff, 1980].

In this article, I attempt to address this gap in the literature by introducing the concept of *serendipitous relations*. A bidirectional, person ←→ context process [Lerner, 2006] based on relational developmental systems theories (RDSTs) [e.g., Overton, 2006, 2010], serendipitous relations can be defined as "mutually beneficial, adaptive developmental regulations" [Brandstädter, 2006] brought about by the time-extended coaction of intentional self-regulatory (ISR) actions and unexpected non-normative life events. Throughout this article, I will argue that serendipitous relations constitute an important and understudied influence on life span development that is consistent with and complimentary to various extant relational theoretical positions.

This article has six main sections. First, I trace serendipity's etymology over its relatively brief history. This section highlights the multiple, often conflicting definitions of serendipity and offers some insight into why the concept is currently scarcely used in the developmental science literature. Next, I synthesize these definitions and the core concepts of three prominent developmental theories (i.e., RDSTs, ISR theories, and the life span developmental perspective) to provide an operationalization of serendipitous relations. In the third section, I describe five ISR processes that I hypothesize lead to serendipitous relations. Fourth, I introduce a three-phase model of serendipitous relations. In the fifth section, I address key problematics pertaining to this conceptualization. Finally, in the sixth section, I illustrate key hypotheses and point to areas for future research.

Serendipity's Origins and Etymology

To argue that serendipitous relations should be considered important influences on life span development, I believe that it is important to first explore reasons for the concept's current absence from the literature. Some of the blame lies in serendipity's (that is, the word's) curious origins, which allowed for great variation in its usage over time and among groups [for a review, see Merton & Barber, 2004]. As I will illustrate, these usage variations were based on differing definitions of the word that, in addition to causing confusion among users, were also generally incompatible with the person ←→ context relations that underlie contemporary developmental science. The one exception, however, may be serendipity's original definition.

The origins of serendipity lie in a letter penned by the eccentric aristocrat Horace Walpole in 1754. Describing his ability to "dip" his hand into a bookshelf and find precisely the book he was looking for, Walpole related his abilities to those of the "Three Princes of Serendip," protagonists of an eponymous ancient tale (*Serendip* being an

Arabic/Ceylonese word for Sri Lanka) [Merton & Barber, 2004]. In the story, the princes deduce the whereabouts of a very specific missing camel, sight unseen, based on their skillful observation of a series of obscure clues. Walpole [1754] termed the princes' behavior (always making discoveries, by chance and sagacity) serendipity. Here, although perhaps unintentionally, Walpole introduces serendipity as a discovery that involves the *coaction* of sagacity (or wisdom, an "individual" characteristic) and chance (a "contextual" characteristic). However, as a coined word in a private letter, this definition of serendipity, as well as the word itself, lay dormant for decades.

The word serendipity was "rediscovered" and appropriated by an insular group of erudite antiquarians and bibliophiles in the late 1870s and early 1880s. They had encountered the word in a published volume of Walpole's letters [Merton & Barber, 2004]. Among these men, there was much speculation as to serendipity's exact definition, due in part to its lack of Latin or Greek root. For instance, Edward Solly [1875] stated that serendipity was used to "express a particular kind of natural cleverness" involving "the discovery of things that the finder was not in search of" (p. 68). Rather than the skills required for discovering an unexpected event, Andrew Lang [1881] described his notions of serendipity six years later as: "the luck of falling on just the literary document which one wants at the moment" (p. 2). Lang's notion involved the chance and pleasure of the fortuitous timing of such an event. Between these men, therefore, serendipity was alternately used to describe the characteristics of an individual (e.g., a serendipitous bibliophile) or an "event" in the context (e.g., serendipitously happening upon an unexpected book), rather than their coaction, as Walpole described. Whatever the exact usage, these early users modified serendipity's meaning, appropriating it to correspond to certain characteristics of a common, yet complex phenomenon in their collecting or reading: the positive discovery of something unexpected.

This pattern (serendipity's meaning being "refracted" by the behaviors and experiences of its users) continued with the word's next adopters, a group of well-read scientists and doctors. Within serendipity's early community of scientific users, Solly's "skill conception" was most often emphasized, and in some cases, forwarded as an important foundation for scientific development [Merton & Barber, 2004]. For example, Walter Bradford Cannon [1929], known for the "fight or flight" response and the associated Cannon-Bard theory of emotion, frequently discussed serendipity in his medical school lectures [Barber & Fox, 1958; Merton & Barber, 2004], and exhorted his students to be open to unexpected paths or solutions that may emerge during the course of research.

By the mid 20th century, serendipity began to trickle into the common lexicon. As it had through each of its early-user groups, serendipity's meaning was again refracted, this time by shared experiences of the general population. Like the collector happening upon a rare book, or the chemist exploring the properties of an accidentally created compound, everyday individuals can also be influenced by their ability to "make the most of" unexpected opportunities. However, unlike the early users of the word, the general population does not engage in the specific shared goal pursuits of scientists or antiquarians; not every individual undertakes research, nor does every individual collect rare books. In the general population, one likely now cites serendipity as an unexpected instance of more diverse occurrences, for example, the selection of a partner, or an occupation, or a pastime. The lack of a shared reference point from which to consider serendipity as a "skill," or specific "kind of natural cleverness," may have influenced the current common usage of the word: Serendipity is now often a synonym for a lucky, happy accident, and it is therefore clearly more "Lang" than "Solly."

Antimonies and the Exclusion of Serendipity from Historical Developmental Theory

The idea that serendipity or serendipitous relations may be *either* sagacity *or* chance (or, either an attribute of the individual or a characteristic of the context) is an example of an antimony [Overton, 2006]. In science, antimonies are founded on a fundamental, non-reciprocal split conception of "pure forms" based on a neo-positivist, Cartesian, reductionist worldview [e.g., Overton, 2006]. For the majority of its existence, the study of human development "has been the captive" of antimonies (e.g., nature-nurture) based on a reductionist framework [Lerner & Overton, 2008, p. 245]. By comparison, RDSTs emphasize mutually reciprocal and constitutive relations between all levels of an integrated developmental system [Lerner, 2006; Overton, 2006, 2010]. Therefore, from an RDST perspective, the isolation of individual and contextual bases for serendipitous relations invites complicated, yet wholly unnecessary, problems that may have made the study of serendipity seem unattractive.

Although, to my knowledge, no social scientist has explicitly presented a split conception of serendipity in his or her research, a few examples in the literature indicate some evidence of this view. These concerns were often methodological in nature. For instance, the sociologist Howard Becker [1994] highlighted practical and methodological challenges to studying chance events by describing a study of meteors. In this study, astronomers taped the night sky using many remote cameras across many days, hoping to catch at least a fleeting glimpse of a rare meteor. Becker [1994], wistfully explaining that such a data collection technique for a sociological study of coincidences was not feasible, wrote that "no one would pay for such an enormous 'fishing expedition'" (p. 192).

Becker's sentiments reflect those of psychologist David Krantz [1998], who lamented the absence of chance occurrences from psychological studies. Like Becker, Krantz illustrated what he considered to be fundamental methodological limitations of studying chance events. Arguing that historical research in psychology was based on the "expectation that simple, universal laws of animate behavior could be discovered," Krantz held that the general methodology of psychology was designed to "allow these laws to be teased out of the complex, indeterminate, often chance-like real world" [Krantz, 1998, p. 93]. Psychology's research paradigm, according to Krantz, resulted in the study of chance events to be "fundamentally unresolvable at the data level" because it was these chance events themselves that research designers explicitly seek to control [Krantz, 1998].

While addressing different issues, both Becker's and Krantz's positions reflect a split, more "Lang-like" conception of serendipity. If serendipity is simply a happy accident, like a meteor passing through the night sky, then, as Becker illustrates, collecting data on serendipity's role in human development would be restrictively costly. If serendipity is simply chance, as Krantz seems to hold, then the researcher cannot model relationships between serendipity and other factors, as serendipity itself (as chance) would be essentially unpredictable. Clearly, if the measurement of a concept is restrictively costly or scores from the measure bear no predictable relation to criterion behaviors, then the study of the concept would not be productive, and the concept would have a limited role in any scientific field.

Examples of Serendipity in Contemporary, RDST-Based Literature

Not all scholars would take the bleak view about the use of the concept of serendipity suggested in Krantz's [1998] analysis. For example, Albert Bandura [1998], in a commentary on Krantz's article, offered critiques of Krantz's position as well as suggestions for future scholarship on unexpected events. While the prediction of fortuitous events themselves may be beyond the capabilities or auspices of psychology, Bandura [1998] noted that psychologists should be able to identify the particular characteristics of individuals who avail themselves of and generally benefit from their occurrence. Further, Bandura argued that fortuitous events were not simply "chance" alone, but rather came about through the sorts of person ←→ context bidirectional relations that characterize the RDST approach. That is, Bandura [1998] argued that individuals can bring about fortuities through their inquisitive, persistent actions. Supporting this position, he writes that:

> Psychology can (also) provide a conceptual scheme for predicting the nature, scope, and strength of the impact that chance encounters will have on human lives. The fact that an initiating event is fortuitous does not mean that the entire trajectory is a random one. Framing fortuitously activated processes of change as ones that are empirically unanalyzable is a prescription for investigatory paralysis. [Bandura, 1998, p. 97]

Michael Lewis [1998] extends this argument throughout his book *Altering Fate: Why the Past Does not Predict the Future*. Lewis' central thesis is that assuming the dominant, "gradualist," or continuity-based approaches to the study of development (e.g., attachment theory or the psychoanalytical model) actually obfuscates, rather than clarifies, the developmental processes that the researcher wishes to study. From this lens, he argues that unexpected influential events may "make efforts at prediction seem impossible" [Lewis, 1998, p. 7].

In Lewis' opinion, nothing could be further from the truth. In fact, he argues that the individual's attempts at marshaling an adaptive response in the face of unexpected events are an essential and understudied element of an individual's ontogeny. In addition, he argues that applied programs and interventions that foster developing these within-time adaptive responses to the unexpected may be more beneficial than current approaches, which emphasize early intervention. Combining the pragmatic approaches of William James with the foundational concepts of RDST, Lewis [1998] summarizes his position by noting that:

> Individuals develop in the presence of random events, and lives are more characterized by zigs and zags than by some predetermined, connected, and linear pattern. It is only when we understand how organisms are influenced by their environments *now* and how their ideas that exist *now* for their futures can affect their desires and behaviors that we can understand the nature of development, how we got to be what we are, and how we might go about making a more perfect and just society, both for ourselves and for those less fortunate than we. (p. 11)

Serendipitous Relations: A Theoretical Grounding and Operationalization

The arguments of both Bandura [1998] and Lewis [1998] indicate that research framed by an RDST approach should be capable of at least describing, and perhaps explaining and optimizing [Baltes, 1987; Baltes, Lindenberger, & Staudinger, 2006],

the particular characteristics of the individual-in-context [e.g., Magnusson & Stattin, 1998] associated with increased benefit from unexpected events. Having invested considerable space in describing the "investigatory paralysis" that may have resulted from a split conception, I will now attempt to justify serendipitous relations as a key feature of life span human development by offering a theoretical grounding and operationalization of the concept. Once again, I define serendipitous relations as mutually beneficial, adaptive developmental regulations brought about by the time-extended coaction of ISR actions and unexpected non-normative life events. The following five-point heuristic below provides an organized theoretical justification for this definition based broadly on RDSTs, action-theoretical ISR theories, and life span human development theories.

(1) Relational Developmental Systems Underlie Human Development

Historical perspectives on human development were generally characterized by a Cartesian reductionist conception of human development [Lerner, 2006; Overton, 2010]. While these conceptions persist at varying levels across psychology, much of the work in contemporary developmental science is based on RDSTs [Overton & Lerner, 2012], which hold, among other tenets, that multidirectional relations among all levels of the system (e.g., cell, individual, community) influence human development [Lerner, 2006]. From an RDST perspective, therefore, the fundamental units of analysis are measures of person ←→ context relations, rather than measures of the individual or context alone [Lerner, 2006]. In this way, the study of serendipitous relations as a coactive person-context process is better suited to the predominant metatheoretical position of developmental science than are studies of an "individual's serendipity" ("sagacity"; a set of skills or behaviors) or the "serendipitous potential of a context" ("chance"; a set of environmental conditions or influences).

(2) Within the Frame of RDSTs, Self-Development Occurs through ISR Processes

In relational developmental systems models, individuals can produce their own development through their action [Lerner, 1982]. In this way, a person's agentic self-development [e.g., Brandstädter, 2006] has long been considered a key influence on the life course [e.g., Heckhausen, 1999; Heckhausen, Wrosch, & Schulz, 2010]. One prevalent metatheoretical position used to study this topic is the action-theoretical model [e.g., Geldhof, Little, & Colombo, 2010], which, appropriately enough, is broadly concerned with the influence of one's actions and control thereof on self-development [e.g., Little, Snyder, & Wehmeyer, 2006]. Action-theoretical perspectives specify that one's self-developmental actions are organized around meaningful developmental goals [Heckhausen et al., 2010]. Such goals have a variety of labels in the literature, including personal projects [e.g., Little, 2007], goals of intentional self-development [Brandstädter, 2006] and personal goals [e.g., Riediger, Freund, & Baltes, 2005].

In order to achieve these long-term goals, an individual must strike a balance between his or her strengths or weaknesses and the resources or challenges present in the context. These chosen, organized actions-in-context that further valued goals or purposes are termed *intentional self-regulation* in the literature [e.g., Lerner,

Freund, DeStefanis, & Habermas, 2001; Napolitano, Bowers, Gestsdóttir, & Chase, 2011a]. There are many theories that describe intentional self-regulation. For instance, the prominent selection, optimization, and compensation model (SOC) [e.g., Baltes & Baltes, 1990; Baltes et al., 2006; Freund, 2008; Freund & Baltes, 2002] holds that in order to best maximize goal-related gains and minimize goal-related losses, individuals should channel their energies towards a small number of goals (selection), develop specific strategies to achieve those goals (optimization), and "bounce back" with new strategies when initial plans fail due to losses in resources (compensation). Whatever the operationalization, research has linked higher levels of ISR actions to a variety of positive within- and across-time outcomes across the life span [e.g., Ebner, Freund, & Baltes, 2006; Freund, 2008; Gestsdóttir & Lerner, 2008; Mischel, Shoda, & Rodriguez, 1989]. Of course, no two "goal pursuits" (or "goal pursuers") are identical. A variety of factors can influence goal hierarchies, goal strategies, and the likelihood of goal attainment.

(3) ISR-Based Goal Pursuits Can Vary in Terms of "Linearity" of ISR Actions, and This "Linearity" Is Influenced by Age- and History-Graded Life Events

When an individual's goal pursuits occur in a somewhat "linear" fashion, for instance, successfully preparing for a marathon by following a training regimen without incident or complication, he or she could be exhibiting high levels of primary control [Heckhausen et al., 2010], or can be understood as making wise goal selections and choices for goal optimization strategies [Baltes et al., 2006]. However, this linearity is not always guaranteed. The journey towards goal achievement can be circuitous and full of setbacks [Backman & Dixon, 1992; Heckhausen, 1999]. An RDST perspective holds that interrelated, "co-constructing" factors at all levels of the developmental system jointly contribute to these branching paths in the life course [Li & Freund, 2005] by constraining or affording the action resources necessary to achieve goals [Brandstädter, 2006].

How do individuals "bounce back" after their best-laid plans go awry? Various self-regulation theories describe the ways individuals can minimize loss – and potentially later maximize gains – during diversions or setbacks. One component of this process is described as *compensation* in the aforementioned SOC model. For example, a compensating individual seeking to complete a dissertation may choose to write in a quiet classroom after attempts to be productive at home did not work because of the interference of noisy roommates.

Alternatively, for various reasons, an individual may deem a goal to be unattainable, or that the pursuit of a goal may incur more potential losses than he or she is willing to accept. In these situations, the individual may disengage from the first goal and instead pursue another goal. According to Brandstädter [2006], portions of this process are deemed *flexible goal adjustment*, while Heckhausen [e.g., Heckhausen et al., 2010] terms components of these actions *compensatory secondary control* strategies. Returning to the SOC model, Freund, Baltes and colleagues term this type of goal disengagement, and later re-engagement with alternate goals, *loss-based selection* [e.g., Freund & Baltes, 1998].

However, these processes only describe one half of goal "non-linearity." How do individuals adjust their plans when an unexpected goal emerges due to *gains*? A relative gap in the theoretical literature and theory exists when it comes to detailing these

gain-related processes. To my knowledge, no contemporary ISR theory expressly describes the self-regulatory actions involved when one reorganizes his or her goal structure due to gains, nor does any theory describe the self-regulatory actions involved in identifying or instantiating situations where one *could* select new goals due to gains. Further, no existing ISR theory discusses which types of self-regulatory actions may be associated with maximizing gains arising from unexpected events and emergent goals. When it comes to the particular case of serendipitous relations, these latter self-regulatory actions and processes represent the core individual-level component of the coactive process.

More generally, what kinds of events may bring about non-linearity in ISR actions, whether in response to gains or losses? One way to categorize these influences is to borrow from the foundations of life span developmental research [e.g., Baltes et al., 2006], which posited three major influences on the life span development: (1) age-graded factors; (2) history-graded factors; and (3) non-normative factors. What follows here is a description of these influences, and their role in shaping an individual's ISR action.

Age-Graded and History-Graded Influences on Goal Linearity. Some influences related to goal non-linearity can be conceptualized as age-graded. For instance, traditional conceptualizations of development proposed that, across the life span, normatively developing individuals are confronted with a series of sequential age-graded developmental tasks requiring the exercise of some sort of self-regulatory capacity to achieve [Erikson, 1968; Havighurst, 1953]. A clear and more recent instance of this concept involves the study of goals arising from age-graded developmental deadlines [Heckhausen et al., 2010]. This age-graded research often focuses on goal non-linearity based on losses. For example, one's chances of becoming pregnant (barring medical procedures) after menopause are limited; approaching or passing this developmental deadline can greatly affect goal structure and efficacy [Heckhausen et al., 2010]. Of course, age-graded influences are not entirely individual-based. Societies often reinforce these age-graded influences on ISR actions by providing norms and expectations for timely goal completion. For instance, one may be more likely to experience losses by failing to finish college in one's 20s, or by needing to work past standard retirement age [e.g., Bossé, Aldwin, Levenson, & Ekerdt, 1987].

History-graded events also influence the linearity of ISR actions and processes. In the case of these life events, losses can perhaps be best conceptualized as historically bound constraints on goal choice or chances for goal achievement, while gains may be best understood as expanded potential pathways or improved chances. In this way historical processes like an increasingly "globalized" world [Larson & Wilson, 2004] or the Great Depression [Elder, 1974, 1980] alter one's life course in an "absolute" or probabilistic sense, by instantiating, eliminating, promoting, or minimizing the likelihood of attaining certain goals.

New opportunities or challenges present in the context due to history-graded events do not necessarily unilaterally affect one's development. Individuals must act to maximize gains and minimize losses from these events. For example, recent research indicates that the utilization of history-graded environmental affordances, like the widespread youth development programs currently present in the United States [Eccles & Gootman, 2002], coactively influences the relations between the types of ISR strategies adolescents use and their positive development [Urban, Lewin-Bizan, & Lerner, 2010]. As contextual constraints and affordances to goal achievement are

historical and societally bound [Brandstädter, 2006], one can expect that future historical variations in youth development programs, or in any other contextual influence, will impact the linearity of an individual's intentional self-regulation.

In sum, gains or losses arising from age- or history-graded sources can alter the linearity of goal strivings. While these processes are important influences on life span development, they are not, however, the primary focus of this research.

(4) Non-Normative Life Events Also Influence the Linearity of One's ISR Processes

While unexpected age- and history-graded events surely influence ISR processes, I contend that serendipitous relations involve unanticipated gains that develop through the idiographic coaction of intentional self-regulation and unexpected, *non-normative* life events. In general, non-normative events refer to individual and contextual phenomena that do not occur in a normatively age-graded or history-graded manner [Baltes et al., 2006].[1]

Unlike the influence of age-graded factors, which follow a U-shaped pattern of greater influence over early and later parts of life, and history-graded factors, which are thought to be particularly influential during adolescence, Baltes et al. [2006] speculated that the influence of non-normative life events increased across the life span. Recalling Werner's [1957] orthogenetic principle, which holds that development progresses to states of greater articulation, differentiation, and hierarchical organization, Baltes et al. [2006] argued that non-normative life events show this increase in importance across the life span because of the accumulation of varying life experiences, which results in greater and greater heterogenic individuation. That is, as individuals age, their unique non-normative experiences, events, and goals become key influences on their life's narrative [McAdams, 2011].

Given their idiosyncratic nature, goal strivings that emerge from non-normative life events differ from those that arise from normative age-graded influences (e.g., completion of secondary education) or those from history-graded influences (e.g., finding employment during the Great Depression). For goals arising from these latter two types of life events, the individual can more readily refer to archetypical individuals (e.g., exemplars in his or her age group or mentors in his or her sociocultural context) or patterns of behavior (e.g., cultural scripts or norms of behavior) as guideposts for ISR actions [Brim & Ryff, 1980]. The more idiosyncratic goals emerging from non-normative influences (e.g., regaining motor functioning after an accident or injury) likely require

[1] Unexpected events can of course be age-graded (for instance, early pubertal timing) or history-graded (for instance, change in employment opportunities for American women after the mobilization following the Pearl Harbor attack [e.g., Hernandez, 1993]). However, in contrast to non-normative events, which are more idiosyncratic in nature and thus better suited to the person-context foundations of serendipitous relations, age- and history-graded events are generally primarily individual-based or context-based, respectively. Thus, while gains may arise from the individual's skilled use of intentional self-regulation in response to unexpected age-graded or history-graded events, these gains do not specifically reflect examples of serendipitous relations. Rather, the gains that may arise from age- or history-graded unexpected events could be, like serendipitous relations, generally considered as adaptive ISR responses to unexpected changes in the developmental system. The basic contention here is that serendipitous relations, while perhaps involving specific and somewhat uniform self-regulatory actions across individuals, are *essentially idiographic*, rather than common across specific age groups or sociocultural cohorts.

unique, situation-specific suites of ISR actions in order to achieve adaptive outcomes. Given that these life events are by definition not normative, the individual lacks the support or guidance he or she may have for challenges arising from age- or history-graded life events. This absence may result in, as Wrosch and Freund [2001] state, "the relative importance of the individual (being) enhanced for regulating non-normative as opposed to normative developmental challenges"(p. 272). For example, in the oft-mentioned scenario of winning the lottery, the individual may risk losses if he or she, flush with new wealth, spends unwisely without proper financial advice or behavior.

While non-normative life events are key influences on life span development, they are comparatively less studied than age- or history-graded events. When they are discussed, the focus is generally on calamitous or catastrophic events. For example, consider the story of Paul Watkins, as relayed by Bandura [1982]. A promising youth who had been elected student body president of his high school, he traveled to California after graduation to meet a friend. Unbeknownst to Watkins, the friend had moved out of his home, and the new tenants were the infamous Manson Family [Watkins & Soledad, 1979]. Soon, Watkins became a member of the group, adversely altering his life forever.

Clearly, not every negative non-normative life event is as irreparably catastrophic as knocking on Charles Manson's door. Individuals can enact ISR actions in an attempt to moderate the influence of these negative unexpected non-normative life events. For example, in the face of failing an entrance exam to a university-like setting, individuals who can successfully disengage from this unexpectedly blocked goal have more adaptive levels of functioning over time [Tomasik & Salmela-Aro, 2012]. In this example, the individual uses specific ISR disengagement strategies to, at least in the most proximate sense, minimize losses and attempt to maintain functioning in the face of failure. While these processes are important, the overrepresentation of calamitous non-normative life events in the literature (compared to fortuitous and positive non-normative events) results in a critical theoretical lacuna involving understanding the role of ISR processes in maximizing gains from non-normative events.

(5) There Are Specific ISR Actions Involved in Maximizing Gains from Unexpected Non-Normative Events

The basis for this conceptualization of serendipitous relations lies in an RDST-based life span human development perspective, and specifically within action-theoretical models of intentional self-regulation [e.g., Brandstädter, 2006]. However, due in part to roots in gerontology (which is generally focused on issues of loss or decline), the life span human development-based ISR literature [e.g., Freund, 2008] is currently lacking a description or explanation of the particular kind of ISR processes that are at the focus of this article: those actions that maximize gains from unexpected non-normative life events. This section attempts to address this point by introducing serendipitous relations as "new wine" from the "old bottles" of RDST, intentional self-regulation, and life span developmental theories.

To begin with, it seems important to address that non-normative life events may have unique characteristics when it comes to their relations to an individual's intentional self-regulation. While ISR actions can serve as means to minimize losses or maximize gains arising from age-graded or history-graded factors, an individual has

very little ability to instantiate age- or history-graded influences on the life span. An individual usually cannot will puberty to begin, nor can an individual typically enact geopolitical policy. Non-normative events function differently. From an RDST perspective, these influences are, by their more idiosyncratic nature, at least partially instantiated by the actions of the individual as they progress across their "thread of life" [Wollheim, 1984]. From this perspective, non-normative life events are not simply random chance, but rather have some foundation in an individual's action. In addition, as illustrated in the prior section, an individual can modulate the influence of non-normative life events through ISR actions, and such actions might be especially important for adaptive functioning given the lack of social supports or guides. Thus, unique among the factors specified in the life span developmental perspective, non-normative life events provide an opportunity to study the *bidirectional coaction of ISR processes and contextual influences*.

The remainder of this section introduces some ISR processes that may be associated with maximizing potential gains from such events. To frame the introduction of these processes, I will summarize a story told by the anthropologist Richard Leakey [2010] in a volume whose focus was on the role of serendipity on scientific discoveries [de Rond & Morely, 2010]. Attempting to disprove the somewhat dismissive claim that "Leakey's luck" alone led to the success that he and his family members have had in discovering some of the most important anthropological specimens in history, Richard Leakey describes many of the ISR processes that may instantiate and maximize gains from unexpected non-normative events.

Here I offer specific examples of actions maximizing gains from unexpected events. According to his son Richard, Louis Leakey's future seemed foreclosed: he was to be a missionary in Kenya, like this father, and the first step in this process was a theological degree from Cambridge. A severe concussion sustained in a rugby match changed these plans. The prescribed treatment for the injury was a break from studies. During his recuperation, Louis heard of a German paleontological expedition to part of the current Tanzania that was in need of a Swahili translator. Louis, being fluent in Swahili and unexpectedly available during his recuperation, applied and was accepted for the position. Soon after arriving, Richard writes, he "became absolutely riveted by the evidence of early life in the form of dinosaurs" [Leakey, 2010]. Upon returning to Cambridge, he dropped his theological studies and focused full time on paleontology. An illustrious and unanticipated career in the paleontology followed.

While Richard Leakey does not describe the following story in the aforementioned article, his mother, Mary, was involved in a fortuitous discovery herself, and one with a most unusual impetus: elephant dung. In 1976, members of her team were playfully tossing projectiles of this matter when Andrew Hill, face to the ground, noticed strange indentations in the ancient ash [Ghiglieri & Bilmes, 2000]. Hill had discovered a field of prehistoric footprints.

One set of these footprints looked vaguely hominid. Mary, jumping at the potential for a major find, devoted her team to the attempt of finding more specimens. Two disappointing years later, without a suitable footprint to show for their efforts, Mary instructed the crew to excavate the site and instead look for bones. Ndibo, the crew's maintenance man, cleared away some debris from the field, and, to his shock, uncovered what the team had been looking for all along: a pair of nearly perfect ancient hominid footprints. Ndibo notified Mary, and, upon viewing the area, she ordered

the prints to be painstakingly examined [Ghiglieri & Bilmes, 2000]. Mary Leakey and her team, beginning by dodging elephant dung, had uncovered groundbreaking evidence of our early ancestors' bipedalism, recasting notions of human evolution [e.g., Hay & Leakey, 1982; Leakey & Harris, 1987].

To return to Richard Leakey's defense of his family's discoveries as being more than simply "Leakey's luck," he writes:

> So I think that what people call luck is very much an element or characteristic of being willing to recognize and exploit opportunities. When you see an opportunity, you should definitely take it and accept that there are high risks sometimes in doing so. In a sense, it gets back to what serendipity was supposed to be about when it was coined back in the 1700s, emphasizing the role of sagacity in exploiting accidental occurrences. [Leakey, 2010]

Introducing Serendipitous Actions: Five ISR Processes Potentially Involved in Serendipitous Relations

The Leakey's stories illustrate instances of serendipitous relations and provide examples of five key ISR processes that I hypothesize instantiate and substantiate such beneficial person ↔ context exchanges. The five key ISR processes are described in more detail below.

Process 1: Having a Serendipitous Orientation

The first and most general ISR-based serendipitous action is having intentional serendipitous orientation. Using Richard Leakey's words, such an orientation involves "being willing to recognize and exploit opportunities," despite the risks that such behavior may entail. Individuals with a serendipitous orientation *choose* to not "wear blinders," that is, they choose to not be foreclosed in their goal selections, and instead to be open new possibilities, new goals, and new outcomes. Individuals with a serendipitous orientation intentionally put themselves in situations where positive unexpected events are more likely to occur. In addition, those with a more serendipitous orientation select and work towards achieving goals that arise from such unexpected circumstances. These individuals likely have a growth, rather than maintenance orientation [e.g., Freund, Hennecke, & Riediger, 2010; Mustafić & Freund, 2012]. In addition, individuals choosing to employ a serendipitous orientation are likely highly agentic, and excel at facing the unexpected challenges [e.g., Little et al., 2006].

The Leakey's stories illustrate two key complexities inherent to the concept of a serendipitous orientation: (1) it may be more common to be serendipitously oriented during particular periods of the life span, or given particular contextual conditions; and (2) an individual chooses to be serendipitously oriented within the context of goals of greater or lesser abstraction. Beginning with this first complexity, recall that before the injury, Louis' fate seemed preordained. At this point in his life, it seems Louis was not serendipitously oriented. Unlike the personality factor "openness to experience" [e.g., McCrae & Costa, 1997], I hypothesize that a serendipitous orientation is a more plastic individual factor, given its intentionality. That is, during certain periods of life, or given particular contextual conditions, individuals may be more or less likely to choose to engage in goal pursuits that arise from unexpected events. In

terms of periods of the life span, it may be that having a serendipitous orientation is more likely during adolescence and young adulthood. Louis' status as an unencumbered young student without long-term commitments may have influenced or eased his choice to act with a serendipitous orientation and be open to unexpected opportunities. In terms of contextual influences, Louis' unexpected head injury allowed him to pause and evaluate his studies. This period of reflection perhaps contributed to his choice to be more serendipitously oriented.

The second key complexity – that an individual chooses to be serendipitously oriented within the context of goals of greater or lesser abstraction – requires a more nuanced discussion. An individual's intentional actions can serve to support various levels of his or her goal hierarchy, progressing from proximal goals to more distal, abstract goals [Freund, 2008]. For instance, an adolescent may exercise to achieve the more proximal goal of making a sports team while also serving the more abstract goal of improving physical well-being. Choosing to be serendipitously oriented is a type of intentional action, and therefore can also serve to support various levels of an individual's goal hierarchy. For example, choosing to be serendipitously oriented in academics during the first year of university (e.g., enrolling "undecided") may serve the more proximal goal of increased exposure to new topics, while also serving the more distal, abstract goal of finding a career or area or interest that is personally fulfilling and enjoyable.

While choosing to be serendipitously oriented may affect one's proximal or distal goal pursuits, a serendipitous orientation is itself grounded in a specific goal pursuit that may exist at varying degrees of abstraction. This grounding can influence the types of unexpected events that an individual encounters and may choose to pursue. For examples of this phenomenon, consider the Leakey's stories. Louis' injury provided him with an opportunity to pause his unfulfilling theological studies. Choosing to be serendipitously oriented in regard to the abstract goal of finding an enriching career, Louis happened upon the opportunity to travel to Africa, and began his sterling career in paleontology. Mary, on the other hand, chose to be serendipitously oriented in regard to the more specific goal of maximizing scientific return on a promising excavation site in Tanzania. Mary twice decided to pursue the unexpected opportunity to dig for more footprints rather than continue on the original pursuit of unearthing fossil remains. These stories indicate that the degree of abstraction with which one is serendipitously oriented influences the type of opportunities he or she may encounter.

Processes 2 and 3: Identifying Unexpected Events and Seizing the Moment to Act

Recall that Horace Walpole's original definition for serendipity involved "chance and sagacity." Where having a serendipitous orientation may increase the likelihood for positive chance events to occur for an individual, the next two serendipitous actions more directly involve a degree of "sagacity," that is, wisdom or skill. Beginning with the first of these processes, it seems obvious that in order to benefit from an unexpected event the individual must first identify it being potentially laden with gains. This discerning process would require the individual to exert attentional focus to detect that the event is unusual and in fact comprised of relevant or desired characteristics [e.g., Colombo, 2001]. This process also likely involves related cognitive pattern

recognition processes [e.g., Diamond, 1988], where the individual identifies the event as being anomalous and potentially gains-laden. The "sagacity" or skill in this serendipitous action is being attuned to one's environment and identifying the key, potentially motivating characteristics of an unusual event.

Simply recognizing an unusual event as being potentially gains-laden is not enough. An individual must seize the opportunities that they identify in that unexpected event. This third serendipitous action is a "mirror image" of Baltes and colleagues' *loss-based selection* [e.g., Freund & Riediger, 2003]: instead of selecting a new goal based on experienced systemic losses or declines (as is the case with loss-based selection), the individual instead directs resources towards an unexpected, emergent goal based on the perception of possible systemic gains. In this serendipitous action, the individual therefore makes a "gains-based selection," that is, he or she determines that the potential gains that could arise from pursuing this unexpectedly emergent goal warrant some initial and provisional investment of resources. During this provisional investment, the individual can then compare the potential for gains arising from the emergent goal to the perceived gains that could arise from the current goal. The extent of how provisional this initial investment may be likely varies from individual to individual, or circumstance to circumstance. Some instances of "seizing" an unexpected opportunity may result in a "dead end" or mismatch, while others, like the example of Louis Leakey, may be the launching point for serendipitous relations across the life span.

Returning to Mary Leakey's story, we see the importance of identifying and seizing unexpected opportunities in serendipitous relations. In fact, the story contains several pivotal instances of both serendipitous actions. First, in terms of identifying events, the perceptive dung-dodging team member provided the genesis for the serendipitous relations by identifying the footprints. Years later, Ndibo unexpectedly identified the long-sought footprints and restarted the vigorous search. In terms of seizing the opportunities, Mary twice ordered her team to scour the area – first, after the initial discovery of tracks and, second, after Ndibo's definitive discovery. Wagering that the possibility to find early hominid footprints was sufficiently high, Mary Leakey provisionally invested resources, comparing the gains that could arise from the footprints' discovery with the gains from the fossils. As the evidence mounted for the footprints' importance, Mary began using the fourth and fifth serendipitous actions, described below.

Processes 4 and 5: Disengaging from Prior Goals and Extending Investments to Transform Events into Opportunities for Gains

Most contemporary ISR theories involve descriptions of the processes of goal disengagement. For instance, accommodative processes described in Brandstädter's work [e.g., Brandstädter, 2006] resemble Heckhausen and colleagues' secondary control strivings [Heckhausen et al., 2010] and can be described as an individual's psychological recalibration or adaptation after hardship or loss. In short, goal disengagement is often described as getting in "flow with the current" [Rothbaum, Weisz, & Snyder, 1982] after one fails at a goal. This process does not entirely match with the proposed serendipitous action of prior goal disengagement.

For this action, if the individual further realizes that the unexpected opportunity may in fact provide gains over-and-above the perceived gains or his or her earlier-

specified, "pre-opportunity" goal pursuit, then he or she fully disengages from that prior goal. The individual then selectively invests energies in the emergent goal, as he or she identifies it as the best chance for promoting positive development. Again, the serendipitous action of prior goal disengagement differs from many of those in the contemporary ISR literature primarily in that the disengagement occurs because the individual perceives greater gains from the emergent goal, rather than perceiving greater losses from the prior goal.

The fifth serendipitous action is most consistent with existing ISR theories. After disengaging from the prior goal, the individual then uses standard ISR actions in order to best assure that he or she can extract maximal gains from the now focal unexpected opportunity. Where this action may vary somewhat with extant ISR constructs is that, upon extending the investment in the emergent goal, the individual may "accrue" unexpected gains along the way, given the unanticipated nature of the serendipitous relation. Thus, the individual must perceive when he or she has indeed achieved maximal (or at least adaptive, or desired) gains from the unexpected event, rather than cutting this process short of this point.

These final two proposed serendipitous actions can be illustrated in the stories of both Leakeys. Louis' story is most clear-cut: once he decided, rather rapidly, that he was suited for a career in anthropology and paleontology, he disengaged from his prior goal of studying theology, and then invested untold hours across his life to achieve maximum gains from his career choice. Mary also illustrated these skills in her story. Once clear footprints were unearthed by Ndibo, she cast away her temporary goal of finding skeletal specimens and devoted her team to painstakingly searching for and excavating the hominid footprints. Both Leakeys extended their investments to achieve maximal gains.

Unexposed, Uncovering, and Unlocking: A Three-Phase Model of Serendipitous Relations

In this section, I will present a three-phase model of serendipitous relations. This model illustrates the time-extended coaction of serendipitous actions and unexpected, non-normative life events. This model, termed the *unexposed, uncovering, and unlocking (or 3U) model of serendipitous relations*, is briefly described below. Figure 1 portrays a typical instantiation of this model.

Phase 1: Unexposed

The first phase, "unexposed," occurs before an individual's exposure to an unexpected non-normative life event. In this phase, individuals are actively working towards their earlier-defined goals. While some individuals with a less-serendipitous orientation may continue to work on earlier goals without distraction, individuals with a more serendipitous orientation may "keep one eye open" for unexpected events that may serve to maximize gains. These unexpected events may already exist in the context, waiting to be "found," or they may be a yet-to-be-instantiated product of the individual's current ISR strivings.

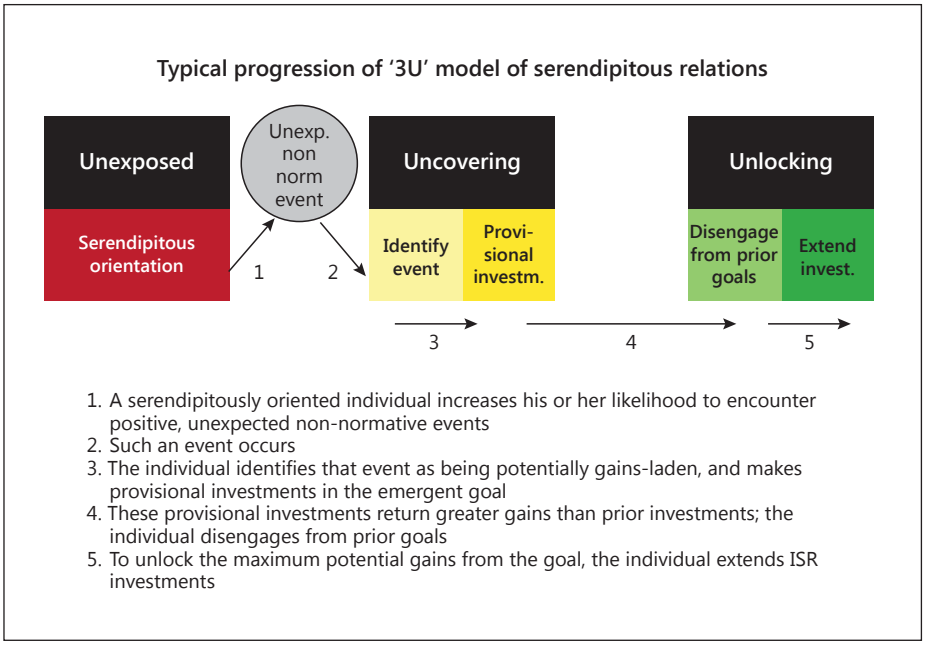

Fig. 1. A description of a typically progressing serendipitous relation, as organized in the 3U model.

While serendipitous relations are mutually beneficial for the person and his or her context, remaining in the unexposed phase is not necessarily maladaptive. For example, an individual may commit to a particular goal, such as being the first family member to earn a university degree. Through adversity, he or she may persevere [Duckworth, Peterson, Matthews, & Kelly, 2007] and earn the degree while ignoring alternate and potentially adaptive pathways, like dropping out to become an entrepreneur. However, earning a university degree is still an important achievement and, especially for "first-generation" graduates, often leads to positive developmental outcomes [e.g., Pascarella, Pierson, Wolniak, & Terenzini, 2004]. In other cases, however, remaining in the unexposed phase and not pursuing alternate pathways suggested by unexpected events might result in personal regret, even *Sehnsucht* [Scheibe, Freund, & Baltes, 2007] or intense longing.

Despite some instances where progressing may not be adaptive, the unexposed phase is still an essential first step for serendipitous relations. The individual's ISR actions during his or her prior goal strivings set the stage, and in some cases, may instantiate unexpected events that may lead to serendipitous relations. As Bandura [1998] notes, "People can make chance happen by pursuing an active lifestyle that increases the number of fortuitous encounters they are likely to experience" (p. 98). Therefore, when an individual's active goal pursuit, serendipitous orientation, and an unexpected, well-suited event coact, the individual is likely to progress from the unexposed phase and into the uncovering phase.

Phase 2: Uncovering

The second phase of serendipitous relations, termed "uncovering," involves the individual's provisional ISR investments after exposure to an unexpected event. This phase primarily involves two of the five serendipitous actions described above: identifying unexpected events, and seizing the moment and beginning to act on those unexpected opportunities.

An individual begins the uncovering phase after identifying an unexpected event that is perceived to be potentially gains-laden. After identification, the individual can choose whether or not to act on the opportunities that this event presents. Seizing a potential opportunity involves provisional resource investments in the goal. These provisional investments may involve exploring the required steps or potential sacrifices necessary to achieve the emergent goal. These provisional goal investments, I argue, likely exist in tandem with contemporaneous investments in earlier-specified goals. Thus, these provisional and parallel investments may provide the individual with an opportunity to assess and compare both the "fit" and potential for maximization of gains between the original and emergent goals.

The uncovering phase, like each of the phases in this model, can be recursive. That is, an individual can identify an unexpected event, and for a variety of reasons, decide not to seize that event. Thus, he or she moves back into the "unexposed" phase pending perception of or exposure to another unexpected event. In addition, an individual can seize the event, make provisional investments, and decide against pursuing the emergent goal. Regardless of the time length or the potential recursiveness, the uncovering phase, like the unexposed phase, is a necessary step towards serendipitous relations.

Phase 3: Unlocking

In the third phase of serendipitous relations, termed "unlocking," the individual intentionally shifts his or her primary goal focus away from the prior goal and towards the emergent goal in an attempt to capitalize on the unexpected opportunity. In this phase, an individual moves from provisional investments in the unexpected opportunity to more definite or focal investments, in an attempt to unlock the opportunities' potential gains. As such, this phase primarily involves the final two serendipitous actions described earlier: disengaging from prior goals and extending goal investments.

The unlocking phase begins when the individual makes a conscious choice to disengage from prior goals in order to maximize the probability of success from the unexpected opportunity. This process reflects something of a "gains-based selection," that is, the individual orients his or her goal resources (e.g., time, effort, energy) [Freund, 2008] towards the emergent goal and away from the prior goal, because he or she perceives comparatively greater possible gains. After this more definitive engagement with the emergent goal, the individual then must use ISR actions to maximize his or her chances for gains. For instance, using the SOC framework [e.g., Freund, 2008], the individual could engage in a variety of optimization and compensation strategies across the course of the goal process until he or she is satisfied with the gains earned from the emergent goal.

The length and intensity of this extended investment likely varies by individuals, by situations, and by their coaction. That is, the unlocking phase of serendipitous relations may last days or it may last decades, as illustrated by Louis Leakey. In addition, emergent goals require variable investment to achieve maximal gains. Whatever the duration or the intensity of the investment, the unlocking phase is a critical final step in any serendipitous relation.

An Example of "Serendipitous Relations Lost and Serendipitous Relations Gained": The Case of the Floppy-Eared Rabbits. To further illustrate the 3U model of serendipitous relations, and how serendipitous relations can be related to positive functioning and development, I will analyze a famous example from the literature: the story of Dr. Lewis Thomas, Dr. Aaron Kellner, and the floppy-eared rabbits. Below, I summarize this story, which was originally told by Barber and Fox [1958].

In the 1950s, prominent medical researchers Lewis Thomas and Aaron Kellner were exploring treatments for cardiac and blood vessel lesions associated with rheumatic fever. Injecting compound after compound on their test subjects – rabbits – the researchers noted that upon injecting the enzyme papain, their rabbits' ears immediately became floppy, rather than rigid. Kellner was focused on exploring the research question at hand. He drove ahead with different enzymes, considering the newly floppy ears "flamboyant" and interesting, at best. Thomas, on the other hand, switched his research focus mid-stream. He "chased it like crazy," spending untold hours consulting the literature, replicating the finding, and examining the rabbit's ears under a microscope. After years of on-and-off again research, his finding – that under certain conditions, cartilage was reactive, rather than remaining essentially inert – proved far more productive than his first research path.

While Dr. Kellner made important contributions over the course of his career (for example, by helping to create a reliable blood supply system for the New York region), he did not engage in serendipitous relations after observing the floppy-eared rabbits. Instead, it was Dr. Thomas who, through his serendipitous actions, maximized his gains from this unexpected event. Where these men diverge is easily discernible using the 3U model of serendipitous relations.

In the unexposed stage, both Kellner and Thomas were embedded within a laboratory context, with access to rabbits and access to enzymes. They were both highly trained biological researchers, and both were exploring the same research question. Both observed the newly floppy rabbit ears after injecting papain. Where the men may have differed is in their serendipitous orientations. Thomas reported being exposed to the concept of serendipity by his medical school instructor, the aforementioned Walter Bradford Cannon [Barber & Fox, 1958]. Cannon's lectures, which emphasized the role of serendipity in science, may have "primed the pump" for Thomas' serendipitous orientation. On the other hand, Dr. Kellner appeared "locked into" his original research goal.

In the uncovering phase, both men observed the change in the rabbits' ears, but it was Thomas alone who identified the floppy ears as a potential opportunity. This led Thomas to provisionally invest resources in pursuing the floppy ears' cause. Kellner, on the other hand, focused on the original goal [Barber & Fox, 1958]. He did not identify the floppy ears as being helpful to his research, and so he did not provisionally invest in them.

Table 1. A comparison of the serendipitous relations of Dr. Lewis Thomas, Dr. Aaron Kellner, Louis Leakey, and Mary Leakey [from Barber & Fox, 1958; Leakey, 2010]

Serendipitous action	Serendipitous relations phase	Dr. Kellner	Dr. Thomas	Louis Leakey	Mary Leakey
Serendipitous orientation	Unexposed	Not in this case	Yes	Yes, after injury	Yes
Identification of unexpected event	Uncovering	Yes	Yes	Yes	Yes
Provisional investment of resources	Uncovering	No, continued to work on prior goal	Yes, investigated ears	Yes, but very briefly	Yes, at two time points
Prior goal disengagement	Unlocking	No, continued to work on prior goal	Yes, dropped earlier research	Yes, quit theological studies	Yes, searched for footprints
Extended investment of resources	Unlocking	No, not on emergent goal	Yes, over several years	Yes, over career	Yes, in footprint dig
Outcome	–	No discovery due to floppy ears	Important scientific contribution due to floppy ears	Influential career	Important discovery

Thomas continued developing this serendipitous relation through the serendipitous actions associated with the unlocking stage, which involved several years of on-and-off research. He determined that investing goal resources in exploring the cause of the floppy ears might be more beneficial than his prior work. Thus, he disengaged from this prior goal. Finally, in order to unlock the maximum potential gains from this unusual and unexpected opportunity, Thomas extended his investment, "chased" the riddle of the floppy ears "like crazy," and after some time, made an important contribution by expanding our understanding of the reactivity of cartilage. In sum, Dr. Thomas' serendipitous actions helped lead to this serendipitous relation. Table 1 compares the differences in the three phases of serendipitous relations between Dr. Thomas, Dr. Kellner, as well as Mary and Louis Leakey.

Addressing Problematics in the 3U Model of Serendipitous Relations

There is likely great variety in serendipitous relations. For instance, the unexpected onset of a career trajectory or being rejected from a first-choice university and yet excelling at and enjoying one's second choice institution could both be considered such relations. In these examples, one could describe the required serendipitous actions for the scenario, and fit the process to the 3U model of serendipitous relations described above. As serendipitous relations, each of these examples would be, on balance, unexpected, positive, and significant.

However, the unexpected events that may catalyze these serendipitous relations might not share these characteristics. For instance, these events may be rare or common. They may be initially experienced as negative, positive, or neutral. Finally, the

events may be immediately significant or only significant after some actions and/or some period of time. In this section, I will argue that these complicating characteristics of unexpected events should not undermine the present conceptualization of serendipitous relations, but could rather help to support it. In so doing, I will introduce several problematics and related hypotheses that represent possibilities for future empirical research.

Variations in Levels of Exposure to Gains-Laden Unexpected Events

An unexpected event is the catalyst of any serendipitous relation. However, different contexts likely provide different levels of these instantiating unexpected events. Within certain sociocultural contexts, an individual with a serendipitous orientation might move somewhat easily from a context with fewer potential unexpected opportunities (e.g., the small, rural town) to one that may have more of these potential opportunities (e.g., the "big city"). Other sociocultural contexts may limit this mobility, often with deleterious effects [e.g., Breen & Jonsson, 2005].

If an individual is embedded within a context that constrains his or her access to gains-laden unexpected events, this situation does not preclude the individual from engaging in serendipitous relations. In these unfortunate circumstances, the individual might remain in the unexposed phase for an extended time, and may perhaps only move into the uncovering phase after a tenacious searching process. Similarly, an individual embedded within a context rich with potential unexpected opportunities is not guaranteed serendipitous relations. For these individuals, serendipitous relations may often terminate before a transition to the unlocking phase; that is, the individual may repeatedly identify and provisionally invest in unexpected opportunities, but later disengage from that process when he or she perceives a greater chance for gains from another unexpected event.

Variations in "Positivity" of Unexpected Events

Serendipitous relations are mutually beneficial for the person and his or her context. However, the unexpected events that begin these relations might not always present themselves as immediately positive. That is, an individual can also engage in serendipitous relations when the unexpected event is initially negative. How might this variation in "positivity" affect serendipitous relations across the 3U model?

When the unexpected event is positive, it likely expedites the uncovering and unlocking phases. Conversely, these kinds of serendipitous relations may have lengthened unexposed stages, as the individual might "wait" for the perfect unexpected event to act, all the while still being serendipitously oriented. An example of an event that may precipitate such a serendipitous relation could be unexpectedly meeting an individual who, impressed with your conversation, offers you your "dream job."

On the other hand, when the unexpected event begins as negative, the uncovering and unlocking phases may be comparatively longer or "more costly" in terms of goal resources. Here, the individual must first identify the negative event as having some potential for gains, which might be a difficult and lengthy process. Next, the provisional investment in the emergent goal may be tentative or limited, given the

losses the individual may have endured from the unexpected event itself. Finally, if he or she progresses from the uncovering phase into the unlocking phase, any residual negative elements of the unexpected event may delay or complicate prior goal disengagement as well as extended goal investment. An example of serendipitous relations initiated by a negative event could be developing a successful entrepreneurial business after having been fired or laid off. Given the variation in unexpected events across the life span, the potential of both positive and negative unexpected events to both instantiate serendipitous relations could be a useful avenue for future research.

Variations in When Unexpected Events Are Perceived to Be Significant

Serendipitous relations are proposed to be key influences on life span human development. Therefore, the unexpected events that initiate such relations, like the relations themselves, are considered to be significant. However, not every instantiating unexpected event is immediately perceived this way. There are at least two distinct types of serendipitous relations that begin with seemingly "insignificant" unexpected non-normative life events.

The first variation is termed the "delayed" serendipitous relation. Here, the individual is exposed to a potentially meaningful unexpected event, but he or she does not immediately identify it as a significant opportunity for gains, and/or does not allocate provisional resources towards exploring the opportunity. Luckily for the individual, the gains from this event are not strictly time-bound, and after some period of time, he or she begins the uncovering and transitions into the unlocking phase. There may be several reasons for delayed serendipitous relations. Most simply, the individual may "miss" the event when it is first observable. Another reason for the delay may be temperamental; that is, rigid (as opposed to flexible) individuals might delay serendipitous relations, giving their tendency to feel discomfort or stress in breaking patterns or habits [e.g., Chess & Thomas, 1999]. In addition, if they do engage in serendipitous relations, individuals who are less serendipitously oriented may do so in a tentative and delayed manner. An example of such a "delayed" serendipitous relation would be a youth who applies to a local, regional campus of a state university, only to be unexpectedly accepted into the more prestigious, main campus location. Because of his or her temperamental reticence to leave home, or his or her failure to identify the main campus as an opportunity, the serendipitous relation may be delayed until a year later, when the youth decides to transfer to the main campus where he or she excels.

The second variation is termed "indirect" serendipitous relations. Elements of this concept are consistent with McAdams' life story model of identity [e.g., McAdams & Cox, 2010], where the individual develops his or her identity through constructing a meaningful life narrative out of a complicated and sometimes chaotic series of experiences. An indirect serendipitous relation involves the narrative-constructing individual ascribing significance to an unexpected event that served to help instantiate serendipitous relations, while also describing that event as being somewhat insignificant at the moment of its instancing.

An example of such a serendipitous relation would be buying a box of academic texts at a yard sale, and months later finding a very influential book for one's research. Here, the individual might recount this portion of his or her life narrative by

stating, "Looking back, if I hadn't bought that dusty box of books, I wouldn't be here today."

Despite the unusual nature of this serendipitous relation, the 3U model is still adequate to describe the process. Instead of the considering first reading the important book as the instantiating unexpected event, the individual instead retrospectively locates that event as the purchasing of the dusty box of books. Therefore, the unexposed phase may be longer and perhaps more convoluted in these types of serendipitous relations, but the individual still uncovers and unlocks the gains that may arise from that event after he or she identifies the opportunity. In addition, given McAdams' concepts [e.g., McAdams, 2011], when an individual retrospectively recounts the events that led up to an unexpected opportunity, he or she may attempt to "make sense" of the serendipitous relation as a whole by trying to understand the actions that lead to its instancing. Thus, the description of these serendipitous relations may emphasize the indirect nature of the unexpected opportunity.

The problematics presented here represent important theoretical and practical considerations for future research in serendipitous relations. In the next and final section, I present additional concerns for future research.

Towards the Empirical Study of Serendipitous Relations

Some paths in life are planned well in advance. Other paths may come about unexpectedly. Because both paths involve setting goals and attempting to achieve them, individuals employ various ISR actions to chart their course and maximize their chances for success. While the actions associated with the "planned route" have been described extensively in the ISR literature [e.g., Baltes et al., 2006; Freund, 2008; Napolitano et al., 2011a], no extant model explicitly describes the self-regulatory actions that one employs to maximize gains from unexpected, non-normative life events.

I believe that the conceptualization of serendipitous relations presented here begins to address this theoretical lacuna. As defined earlier, serendipitous relations are mutually beneficial, adaptive developmental regulations brought about by the time-extended coaction of serendipitous actions and unexpected non-normative life events. In this article, I first provided a rationale for why serendipitous relations (and serendipity more generally) have not been thoroughly studied in the developmental science literature to date. Next, I described serendipitous relations, and based this operationalization on RDST, ISR theories, and the life span developmental perspective. In this final section, I offer key hypotheses and considerations pertaining to the "who," "what," "where," "when," "why," and "how" of future empirical studies of serendipitous relations.

Let us begin by asking a basic question: *Why* study serendipitous relations? I believe that serendipitous relations represent a key and understudied means by which an individual can produce his or her own positive development through intentional actions. I hypothesize that through skilled use of these "serendipitous actions," individuals can transform unexpected, non-normative events into opportunities for thriving. Individuals are more normatively exposed to non-normative events as they age and differentiate across the life span [e.g., Baltes et al., 2006], and, as well, they are more normatively exposed to non-normative events as a result of the sociocultural changes attendant with globalization [Wrosch & Freund, 2001]. With greater expo-

sure to such events for adolescents and adults in various contexts, I believe that the study of serendipitous relations could provide useful insights for future research and application involving the interplay between an individual's intentional action and the often inscrutable affordances or constraints present in his or her system. In sum, I posit that the study of serendipitous relations could contribute to a richer understanding of the complex and multitudinous pathways to thriving.

The second and third topics involve the *who* and *when*, that is, which groups of individuals at which points in the life span are most suitable for future serendipitous relations research? While serendipitous relations can occur for nearly any individual and at nearly any point in the life span, I hypothesize that they may be key determinants for an individual's positive development during periods of life transition. Periods of life transition are fraught with uncertainty; skills that were once useful may no longer apply, old goals may diminish in importance and new goals may emerge in unexpected ways.

Adolescence and young adulthood are periods of great transition and may be particularly populated by unexpected opportunities for gains – those "floppy-eared rabbits" that have the potential for altering the life course [Napolitano et al., 2011a]. If an adolescent or young adult fails to act and capitalize on these unexpected events, and instead doggedly pursues an earlier, potentially mismatched goal, he or she may run the risk of foreclosing on potential alternative expressions of identity development and thus limit his or her positive developmental potential [Marcia, 1980; Napolitano et al., 2011b]. Therefore, given their orientation towards gains [Ebner et al., 2006], adolescents and young adults may be uniquely suited to capitalize on unexpected opportunities and engage in serendipitous relations, and thus well-suited for future serendipitous relations research. In addition, it may prove fruitful to examine serendipitous relations during periods of transition in middle or later adulthood, for instance, following the birth of a child, or retirement or termination from employment.

In terms of *where* geographically, future research should focus, it is important to first note that there may be great variation in the ways that individuals from diverse contexts undertake serendipitous relations, if the concept is in fact salient across cultures. It could be maladaptive for individuals from resource-restricted environments to pursue unexpected opportunities in the same ways that the relatively privileged, resource-rich individuals in this sample do. This does not mean that serendipitous relations are out of the reach of these individuals, but rather that the exact processes to achieve maximal gains from unexpected, non-normative events may vary widely across contexts and across the life span. One testable hypothesis for future research may be that the serendipitous relations in highly resourced contexts may require a "filtering" approach, where one sorts out the best opportunities from those with a lower gains potential. On the other hand, serendipitous relations in resource-restricted environments may require a "scouring" approach, searching for the few unexpected opportunities that may be present in the context. In sum, I hypothesize that serendipitous relations are important sources for positive development across the globe; however, future work should explore the extent to which the concepts of serendipity, serendipitous relations, and serendipitous actions differ across cultural settings.

The next topic addresses pragmatic concerns of research design and methodology, namely: *How* should future serendipitous relations research be conducted? As discussed in the initial portion of this article, the perception of serendipity as an "untestable" and "random" process has seemingly limited its potential to be assessed to

date. I believe that this operationalization of serendipitous relations, and the attendant serendipitous actions that underlie this process, provides a testable frame suitable to begin to broadly assess the role of serendipity in development across the life span. For example, most foundationally, future researchers should assess within- and across-individual variations in the actions required to instantiate and maximize gains from fortuitous events. Addressing this project will require diverse research paradigms and methodological approaches. Some techniques may prove more useful than others.

Longitudinal, self-report questionnaire-based research may provide valuable foundational information on intraindividual changes and interindividual differences in intraindividual change in the use and efficacy of serendipitous actions. Such research could establish reliable and valid means to measure serendipitous actions, and the associations that such actions may have with indices of adaptive development. This questionnaire-based research may also be useful to identify potential developmental trajectories in serendipitous action use and efficacy, as well as differences in these prototypic trajectories across various groups.

While I speculated that the use of serendipitous actions might be prototypically salient for adolescents and young adults, an essential element of serendipitous relations are their idiographic, idiosyncratic nature. Therefore, the utility of methodological approaches based on what has been termed the ''ergodicity assumption'' [Molenaar, 2004] – that is, that patterns of change for groups of individuals can be generalized to each member – may be limited. Instead, future serendipitous relations research might benefit from using methodological techniques that can explicitly focus on intraindividual variation, such as p-technique [Cattell & Williams, 1953; Molenaar & Nesselroade, 2009; Nesselroade, 2001], or configural frequency analysis [e.g., von Eye, 2002]. It may prove fruitful to study intraindividual change using observational or experimental paradigms to ascertain short-term, micro-level processes potentially associated with maximizing gains from unexpected events. Another approach could be utilizing daily diary data collection techniques, or through intensive and purposive sampling during periods of transition.

Future work grounded in qualitative approaches may also prove useful in advancing the study of serendipitous relations. For example, future research could examine the narrative element of serendipitous relations, that is, how between- and within-person variations regarding how individuals narrate their engagement in serendipitous relations may be associated with variation in identity and identity development. For example, how might individuals who recount their serendipitous relations in terms of their agentic actions differ from those who describe these relations in terms of the vagaries of chance?

Given these recommendations, *what* should be the focus of initial empirical serendipitous relations research? Below, I offer three complimentary and potentially concurrent research programs that could begin to address various concepts presented in this article.

Lab-based experimental research could assess whether the underlying cognitive mechanisms involved in maximizing gains from unexpected events are consistent with the 3U model presented here. This research could also ascertain potential sources of variation in these mechanisms, which may include, but would not be limited to: developmental differences; personality, affect, or temperamental differences; or access to goal-pertinent resources. Second, questionnaire-based research programs

with a longitudinal design could assess the use and adaptive utility of serendipitous actions during developmental transitions across the life span. Nested within a larger project that focuses on group-level differences could be a smaller, p-technique-based study that would examine intraindividual variation of serendipitous actions and serendipitous relations in, for instance, a newly enrolled university student, a recently laid-off young worker, a new parent, and a retiree. Finally, third, a program of research involving qualitative approaches would prove very useful in elucidating patterns of serendipitous relations among diverse groups of individuals. This qualitative research could explore the role of serendipity in diverse individuals' life narratives, as well as investigate cultural variations in perceptions of serendipity and perceptions of an individual's ability to transform chance events into sources for positive development.

For each of these research programs, it may be especially valuable to assess how an individual's use of serendipitous actions covaries with conceptually related individual characteristics, such as personality or temperament. For example, given the hypothesis that serendipitous relations may be important sources for adaptive development for adolescents and young adults, future work should investigate the extent to which serendipitous action use is related to or distinct from an individual's tendency towards risk-taking and sensation- or novelty-seeking, behaviors more typical in adolescence [Spear, 2000]. Another particular focus in future research may be openness to experience, as some work has suggested that more open individuals creatively pursue goals [George & Zhou, 2001] and adaptively manage unexpected changes in goal pursuit [LePine, Colquitt, & Erez, 2000], abilities likely associated with the successful use of serendipitous actions. These characteristics are not an exhaustive list, and clearly future empirical work must focus on determining the individual characteristics that are associated with serendipitous actions and how these characteristics support or constrain one's chances for positive development through serendipitous relations.

In summary, unexpected events can, and often do, change our lives. However, as producers of our development, we can shape or modulate the effect of these events, mitigating damage from calamity, or in the case of serendipitous relations, maximizing gains from fortuity. In short, then, I believe that individuals are active agents in their own serendipity. Through the use of specific serendipitous actions, they have the ability to unlock potential gains from positive, unexpected events, and transform them into sources for life-long positive development. While this idea is consistent with the extant literature on agency and intentional self-regulation, future studies of serendipitous relations could shed new light on the diverse and often unpredictable pathways to thriving.

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